State of Montana

Fourth Biennial Report

—— OF THE ——

State Forester

—— TO ——

Hon. Samuel V. Stewart
GOVERNOR

1915-1916

INDEPENDENT PUBLISHING CO.
HELENA, MONTANA

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LETTER OF TRANSMITTAL.

December 1, 1916.

To His Excellency,
Honorable Samuel V. Stewart,
Governor of Montana.

Dear Sir:

In accordance with the provision of Section 10, Chapter 147, Laws of 1909, I have the honor to transmit herewith the Fourth Biennial Report of State Forester for years 1915 and 1016.

Very respectfully,
JOHN C. VAN HOOK,
State Forester.

STATE FORESTRY BOARD:

SIDNEY MILLER ..... Register of State Lands, Chairman
CHAS. A. WHIPPLE ..... State Land Agent
JOHN C. VAN HOOK ..... State Forester

STATE FORESTER'S OFFICE:

JOHN C. VAN HOOK ..... State Forester
D. D. JOHNSON ..... Assistant State Forester
CHAS. S. CAIRNCROSS ..... Field Representative

INDEX

Timber Cruised, Permits and Contracts

During the fiscal years 1915 and 1916 there has been examined, 119,744 acres of land on which has been cruised 272,549,000 feet of timber. The above area consists principally of single sections widely scattered throughout the Northwestern part of the State.

In 1915, 102 free permits were issued for dead down timber for domestic purposes amounting to 1.218 cords.

In 1916, 169 free permits were issued for dead down timber for domestic purposes amounting to 1,729 cords. This class of timber is donated, on application, for domestic purposes free of charge.

In 1915, 9 permits for dead wood for commercial purposes were issued, averaging from 25c to $1.00 per cord, according to location, etc., amounting to 259,000 board feet.

In 1915, 55 permits for green and dead timber for domestic purposes were issued, amounting to 749,000 board feet, for which an average price of $1.50 per thousand was received for green timber, and 50c per thousand for dead timber.

In 1916, 36 permits for dead wood for commercial purposes were issued, averaging 25c to $1.00 per cord, according to location, etc., amounting to 1,005,000 board feet.

In 1916, 110 permits for green and dead timber for domestic purposes were issued amounting to 745,000 board feet for which an average price of $1.50 was received for green timber, and 50c per thousand for dead timber.

In 1915, 9 contracts for green and dead timber for commercial purposes were issued amounting to 4,159,000 board feet for which $3.00 per thousand was received for the green timber and an average price of $1.00 per thousand for the dead timber.

In 1916, 8 contracts for green and dead timber for commercial purposes were issued amounting to 4,597,000 feet board measure, which averaged from $3.00 to $3.10 per thousand feet.

The total amount of timber permitted to be cut for all purposes in 1915 was 5,776,000 feet board measure, while in 1916 the total amount was 7,212,000 feet board measure.

It will be noted that there is an increasing demand for State timber for domestic purposes, while the green timber for commercial purposes is not moving so rapidly, on account of the minimum price of $3.00 being slightly above the market price at the present time.

FINANICIAL STATEMENT:

The receipts and expenditures for the past four years are as follows:

Receipts:

1913	$ 4,688.44
1914	22,689.88
1915	20,079.62
1916	19,938.33

Expenditures:

1913	$ 8,693.02
1914	11,537.10
1915	13.481.08
1916	12,251.71

Expenditures in detail for the fiscal year ending November 30, 1915.

General Expense:

Salary	$ 7,090.63
Travel	2,525.60
Office	851.21
Field	140.59
Total General Expense	$10,608.03

Fire.

Salary Weeks Law Guard	$ 1,979.37
Temporary Labor	108.18
Travel	51.88
Subsistence Supplies	20.42
Equipment	25.89
Northern Montana Forestry Ass'n	687.22
Total Fire Expense	$ 2,873.05

TOTAL EXPENSE FOR THE YEAR 1915 ..... $13,481.08

Expenditures in detail for the fiscal year ending November 30, 1916.

General Expense:

Salary	$ 7,151.81
Travel	2,111.05
Office	232.15
Field	21.70
Total General Expense	$ 9,516.71

Fire:

Salary Weeks Law Guards	$ 2,005.40
Temporary Labor	3.50
Travel	4.90
Subsistence Supplies	
Equipment	5.25
Northern Montana Forestry Ass'n	668.98
Publicity	46.97
Total Fire Expense	$ 2,735.00

TOTAL EXPENSE FOR THE YEAR 1916 ..... $12,251.71

Receipts in detail for the fiscal year ending November 30, 1915.

Timber sold for commercial purposes	$ 16,928.42
Timber sold for domestic purposes	890.18
Collections made for trespass	569.09
Collections, timber cut under Certificate Purchase	1,691.93
Total receipts for 1915	$ 20,079.62

Receipts in detail for the fiscal year ending November 30, 1916.

Timber sold for commercial purposes	$ 18,315.18
Timber sold for domestic purposes	1,101.95
Collections made for trespass	21.00
Collections, timber cut under Certificate Purchase	500.20
Total receipts for 1916	$ 19,938.33

SCOPE AND OBJECTS OF STATE FORESTRY IN MONTANA.

The Field for State Forestry in Montana. The control of so large a proportion of the public forests of Montana by the Federal Government will, perhaps, seem to leave little to be done directly by the State. The big organization maintained by the Forest Service is, at first glance, adequate to meet all Montana's forestry needs and leave nothing for the State but routine work incident to the sale of timber from its lands. Forestry work for Montana has, however, hardly begun—the field has scarcely been touched. The State Forester's office should be expanded to meet the public needs for forestry.

And what are the public forestry needs in Montana? I am sure they will be recognized as needs as soon as mentioned, economic necessities which the State only can meet. The Federal government serves the people of Montana through the Forest Service in many ways. In the administration and protection of the bulk of the mountin forests, it insures a perpetual supply of raw material to the lumber industry of the State, a steady stream flow, stable mountain communities, vast regions unexcelled for hunting, fishing or recreation. It is developing most of the lands of the State, best suited for the growing of timber, to their maximum productive capacity.

Activities of State Forestry. Without encroaching upon or duplicating the work of the federal government, State forestry for Montana should embrace the following activities:

1. Management of areas segregated as State forests.
2. Sale of timber from isolated tracts of State forest land,
3. Collection of statistics of lumber production and consumption, prices and freight rates, with an analysis of current economic factors.
4. Demonstrations throughout the State of the best methods of preservation of farm timbers; information concerning the new uses of wood; development of new industries,
5. Advice to tree planters. Trees for windbreaks and woodlots on Eastern Montana farms, street and park trees for towns and cities; correct methods of trimming shade trees,

6. General educational work. Lectures to school children, pamphlets for school teachers, exhibits at state and county fairs,

7. Cooperation with University of Montana Forest School in studies of logging, manufacturing and marketing of wood and wood products.

8. Cooperation with the federal government in fire protection.

Organization of State Forester's Office. To properly perform these functions, the State Forester's office should be organized somewhat along the following lines:

State Forester.

ADMINISTRATION: Assistant State Forester in charge.

State Forests,
Timber sales on isolated tracts,
Fire protection,
Consolidation of holdings.

FOREST PRODUCTS: A specialist in charge.
Statistics,
Uses of wood
New industries,
Markets.

FARM and CITY TREES: A specialist in forest-planting in charge.
Windbreaks.
Woodlots,
Park and street trees,
Care of shade trees.

EDUCATION: State Forester directly in charge.
Lectures,
Exhibits,
Signs and posters,
Publications.

SPECIAL STUDIES: State Forester in cooperation with the University of Montana Forest School,
Logging,
Milling,
Marketing.

Administration of State Forests. The first duty of the Forestry Department is to properly administer the forested property of the State. As a result of the land exchange with the Federal Forest Service two areas comprising 106,360 acres, on which there is estimated to be 618,857,000 feet of timber valued at $1.856,571, will eventually become the property of the State, the exchange is now awaiting ratification by Congress. Of this area 69,180 acres is located in the Stillwater and Whitefish Districts, 10,590 acres being in Lincoln county and the balance of 48,590 acres is in Flathead County. The other area, consisting of 37,180 acres lies in the Swan River Valley, all of which is in Flathead County. It will be the State Forester's duty to care for these forests in accordance with the established principals of silvaculture and forest management. The land should be retained (all that is non-agricultural in character) as permanent forest land. The timber should be sold as a crop, and cutting to be regulated so as to insure an annual or periodical yield, reproduction of desired species, and gradually bringing the areas to their maximum productive capacity.

Isolated Tracts of State Land. The exchange of lands only considered the unpatented state sections. There remains a large acreage of timbered lands belonging to the State in isolated tracts of one or more sections. It is obviously impossible to administer these lands in an economical way as permanent forest lands, and most of them are strictly non-agricultural in character. The policy of selling land and timber only passes the problem of cut-over lands to the private owner. The proper use of all the land fit only for forestry is primarily a State problem. Waste land is a liability, productive land an asset.

Problem of Cut-over Land. There has already accumulated a large acreage (which is steadily growing) of non-agricultural cut-over timber lands in the hands of private owners. At the present time it is impracticable for private owners to retain these lands for the growing of timber. Unless the State or Federal government assumes ownership they will rapidly become waste lands. This is a problem for both the State and the Forest Service, but so far neither has taken any action. Such lands can be purchased for a nominal sum (from $1.00 to $5.00 per acre.)

I propose that Montana should first sell only the timber from such lands, which it now owns, and retain title to the land itself, and, second, buy all cut-over lands non-agricultural in character which can be purchased for a nominal sum. It will only be a short time until a further exchange with the Forest Service whereby the scattered lands thus acquired can be added to existing National Forests or segregated into compact bodies to become State Forests. This will require an appropriation for the purpose and the legislation, when passed, will commit the State to this policy and will constitute the State Forester's authority to take action.

A Forest Products' Office. The second duty of the State to be performed through its forestry department is to the lumber industry. Our logging camps, our sawmills, our wood-working industries, represent one of the three great industrial enterprises which is building the structure of our prosperity—agriculture, mining and lumbering. The forestry department can become of invaluable assistance to the lumber industry—to the producer, as well as the consumer of lumber.

For the solution of local problems, the State forestry department can become to Montana's lumber industry what the Department of Agriculture at Washington is to the farmers of the nation. The public does not understand the lumber business and, in a great many ways, the lumbermen do not understand their own business. An impartial agency which is able to present the facts to both parties will establish a mutual understanding so necessary to progress.

Statistics; Markets. Statistics of lumber production and consumption, freight rates, costs of productions, selling prices and profits represent one of the first steps. Advertisement of Montana's lumber both in and out of the State showing the qualities and characteristics of the different woods will help to extend the markets. Publications explaining the various grades of lumber manufactured and the uses to which each is suited will help the consumer as well as the producer. Demonstrations of various methods of preserving wood after it reaches the consumer,—fence posts, telephone poles, mining timbers, etc.,—will make the lumber consumer's money go farther, and incidentally establish new markets for wood.

New Wood-using Industries. There is room in Montana for new wood-using industries, such, for example, as pulp and paper mills, wood distillation plants, certain kinds of

furniture factories, and excelsior mills. These industries with their payrolls can be brought into the State if the resources and the opportunities are properly presented. These are only a few of the many ways in which a properly organized forestry department would be able to help the lumber industry and thereby increase the wealth of the Sstate. This would mean the establishment of a Forest Products' office with a thoroughly trained products-engineer in charge.

Farmers' Windbreaks and Woodlots. The third duty of State forestry is to furnish advice and active assistance to tree planters. The treeless plains of Eastern Montana are becoming rapidly converted into farms. One of the needs in the region is for trees to plant as wind-breaks and for wood-lots. Protection against wind for farm buildings and for growing crops and add materially to the value of these farms. The State should grow suitable trees and furnish them free to these farmers and teach them how to successfully plant and grow them. A small woodlot on a farm located on the plains is an invaluable asset. In a great many situations, it is entirely practicable but to make it a realization experts paid by the State must teach the farmers how to plant and care for the trees.

Street and Park Trees. The cities and towns of the State are more and more giving attention to tree planting in streets and parks. This involves the buying of nursery stock, its planting, trimming and care of trees, such as spraying for insect of fungus attack. There is now no organization to which the city authorities can refer for assistance and advice. The State through its forestry department should meet this need. The value to the State of cities with beautiful streets and parks is readily recognized.

Trimming Shade Trees. The street trees in the cities of the State are being "butchered"—they are being beheaded and otherwise mistreated. The proper methods of trimming shade trees is an art unknown in the State, or at least it is not practiced. The forestry department should be equipped so that the right way to trim trees could be made known and put into practice. Beautiful streets are impossible when graced by ruined trees.

Education and Publicity. The State Forester's fourth job is a big one. It is one of education and publicity. Every school child should be made to understand the wonderful

wealth in Montana's forests, the problems involved in their management, and the necessity of protecting them from fire. We can realize industrially and economically on the forest wealth of the State exactly in proportion to public sentiment, which means the public understanding of the problem. We can have a mountain waste—a vast region of solitude and desolation, or a region teeming with life, with growing trees and with wild animals. A non-productive unattractive mountain region, or an income, wealth-producing forest region. We cannot make farms out of mountain country; we must keep them producing timber or they will become waste. Shall we allow Montana to carry a millstone about the neck of her prosperity in the form of non-productive mountain land, or shall we add to her prosperity an ever-increasing income from her mountain forests? The people must support the forestry policy of the State and of the federal government if either is to succeed. They will support it when they understand its economic importance—when they know what forestry is and what an important function it must play in the future development of the State.

Therefore I say it is the duty of the State Forester to teach the school children what forestry is, and what the State and Nation are trying to do with Montana's forests. The next generation will be more vitally concerned with the problem than is the present. The schools are demanding information. They want to know about the trees and the forests. An eager audience awaits the speaker. It is easy to teach the children about forests—the primitive within them responds—but it means a thorough and consistent campaign.

Special Studies. The fifth function of the State in forestry, as I see it, is a long-time job. It is to take up the study, in accordance with the well-established principles of scientific management, of the organization of the lumber business—logging, milling and marketing. A thorough-going detailed analysis would take many years but it would bring results almost every year in the form of better methods and reduced costs. This is so big a job with so many variables that the State is properly the agency to undertake the study. It is the field of research of scientific investigation. It involves many of the problems of labor and capital. The

School of Forestry at the University if eminently fitted to carry at least a part of such a study and some plan of cooperation should be worked out. The Forest Service may also be able to help.

Future State Forestry Policy. The field of forestry and its mission in Montana is large. It is, I believe, closely bound up with the future prosperity of the State. It is the duty of the people to support the excellent work done by the Forest Service and to organize state forestry so as to supplement it. The people through their representatives should make possible a broad forestry policy—should organize a Forestry Department which will serve the needs of the lumber producer and consumer of the present as well as lay the foundation for the economic future of millions of acres of land and thereby insure a permanent industry in wood.

FARM AND CITY TREES.

Windbreaks.

Value of Windbreaks. As the farming section of Montana becomes more and more settled, the need for protection from winter winds becomes constantly more evident, and it will only be a matter of a comparatively few years before windbreaks will have their place on every ranch throughout this region. As the trees grow they will protect dwelling houses, barns and stock, later yielding fence posts and firewood, and finally even rough lumber for building purposes. A windbreak properly planted at this time can not fail to add to the value of the ranch, it being well-known that a farm having a windbreak on it always sells at a higher rate than the same land barren of tree growth.

Before planting is commenced the following essentials should be carefully considered:

Essentials in Planting. 1. What are the directions from which the cold winds blow? If they come from the North and West, the windbreak should be placed in an L-shape on the north and west sides of the buildings; if from the South and West, place the break on these sides. In some cases it may be advisable to plant on three sides, but it is usually not desirable to completely surround the buildings with trees.

2. Never place the trees closer than 100 feet from the principal buildings, otherwise snow—which accumulates in drifts on the inner side of the break—will tend to block up the yard. If feasible, the windbreak may be 200 or even 300 feet from the buildings, and still afford ample shelter.

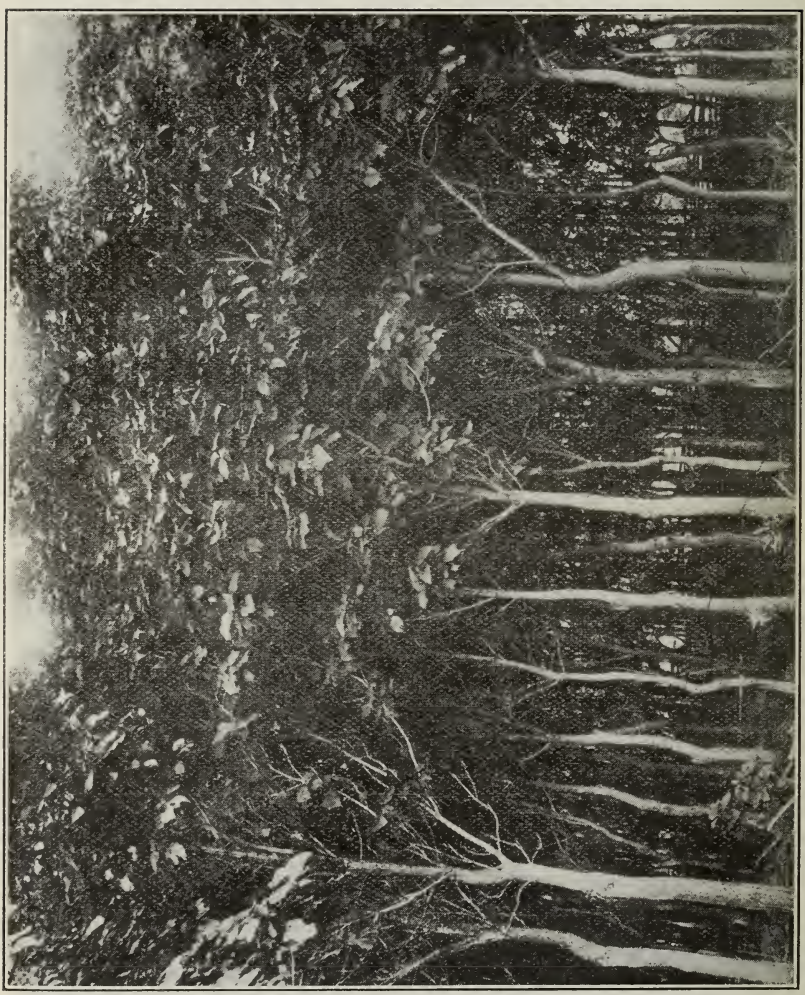
3. In order to have a windbreak which will effectually stop the wind, it should not be less than 40 feet in width, and may be advantageously as wide as 100 feet. The wider it is (within limits) the greater the protective value. Its length will depend on the number of buildings to be protected, the ordinary length of a windbreak being from 300 to 500 feet.

4. Plow the area on which the trees are to be planted, and allow it to lie fallow or planted to a cultivated crop for one year. This is absolutely essential under conditions prevailing in Eastern Montana. Plant the trees the spring after plowing, as soon as native vegetation starts.

What Trees to Plant. In choosing the species, consideration must be given to hardiness, soil and moisture requirements, rate of growth, size, and ultimate value when fully grown. The following species are hardy to Montana conditions:

Cottonwood Windbrake, Showing the Small Value of Only Two Rows of Trees.

A Closer View of the Windbrake Shown Above.



A Good, Wide Windbrake Which Will Effectually Stop the Wind. It Can Eventually be Thinned and Excellent Fence Posts Secured.

Short-lived, Fast-growing Trees.

Cottonwood (Populus deltoides). This is a fast-growing, short-lived tree, extensively used in wind-breaks, because of the quick results obtained. It demands considerable moisture, but is not particular in soil requirements. The wood, though soft, is useful as fuel and for rough lumber. When buying the cuttings, always order "staminate" plants; these have no cotton when fully grown, to litter the yard in the spring.

Balsam Poplar (Populus balsamifera). This has the same characteristics as cottonwood.

Willow (Black or Diamond). Also a fast-growing, short-lived tree, used in much the same way as cottonwood. It requires plenty of moisture, but as long as that is supplied, will grow on almost any kind of soil. Its chief usefulness is as fuel, having a somewhat higher heating value than the cottonwood. Seasoned posts last as long as six years.

Box Elder (Acer negundo). This tree is a moderately fast grower, but short-lived, producing poor wood of low fuel value. It prefers heavy soils, but grows in lighter ones when a moderate degree of moisture is present. It may be found useful in starting a break, but should not be relied upon for permanence.

Long-lived, Slow-growing Trees.

Green Ash (Fraxinus lanceolata). Here is one of the most valuable trees for windbreak planting in this region. It is a slow-growing but long-lived tree, producing wood of good quality and very durable as a fence posts. The tree is not exacting in its requirements, but will do well on light or heavy soils, in dry or moist conditions.

White Elm (Ulmus americana). The elm is a slow-growing, long-lived tree, producing, however, wood of inferior quality. On account of its hardiness it is often used in windbreak planting. It grows best on heavy soils, but will grow on light ones with sufficient moisture present.

Hackberry (Celtis occidentalis). This tree resembles the elm in many ways, but is hardier, and not as exacting in its soil or moisture requirements. It is a good tree for protective planting on account of its hardiness. The wood is of excellent fuel value, but beyond that is not especially useful.

Russian Olive (Elaeagnus angustifolia). Specimens of

this tree rarely exceed 30 feet in height, but in spite of its shrubby appearance, it is a valuable tree for windbreak planting. It is very hardy to the region, and grows well under all conditions of soil and moisture. The wood, when thoroughly dry, possesses excellent heating qualities.

Honey Locust (Gleditsia triacanthus). This species, though not very extensively tried out, will undoubtedly do well under Montana conditions. When mature the tree furnishes durable fence posts. It requires a fairly deep soil but does well in either dry or moist situations.

Red Cedar (Junperus virginiana). For windbreak planting this is a very useful tree, branching near to the ground, and holding its foliage over winter, when other trees are bare. It is a very slow-growing, but long-lived tree, and does well under any conditions of soil and moisture. The wood is very durable, making good fence posts. When orchards are in the vicinity care should be used in planting these trees, for it is on them that one stage of the cedar fungas grows.

Yellow Pine (Pinus ponderosa). Yellow pine will grow only on a light soil, with a moderate amount of moisture present. It is one of the valuable trees for windbreak planting throughout Montana, not only because of the protection afforded by its foliage in winter when other trees are bare, but on account of the value of its products for both firewood and timber purposes.

Spacing. Where quick results are desired, it is best to mix the fast-growing with the slow-growing species, then when they begin to crowd, the fast-growing trees may be removed and utilized, leaving the more valuable, slower growing trees to form the bulk of the plantation. If rapid-growing and slow-growing trees are mixed, space them 4x4 feet apart; then when the former are removed the ultimate spacing will be 4x8 feet. When no thinning is contemplated, space the trees 4x8 feet.

Small Trees on Windward Side. Place the small trees on the side of the break from which the wind blows, with the next larger species in the center and the tallest on the inside. The snow will then be caught and held around the trees. Russian olive, willow, and red cedar are the shortest, next in order coming box elder, green ash, hackberry and honey locust, with elm, yellow pine and poplar, the largest. It is usually well to mix the evergreen and broadleaf trees

in all windbreaks, the former adding greatly to the protective value in the winter, when other trees are bare. The evergreens should not, however, be put in till the broadleaf trees are five to ten years old. Evergreens, when young, need the protection of other trees or they will not live.

Heeling In. As far as possible, purchase trees from reliable local dealers. When they arrive at the depot, take them at once to the farm, open up the bundles and moisten the roots, then "heel in" the trees in a shady spot till planting can be accomplished. "Heeling in" should be done as follows: Dig a V-shaped trench 8 to 10 inches deep, with one side perpendicular, and the sloping side toward the south. Place the roots of the trees at the bottom of this trench, with the trees lying on the sloping side, so that their tops protrude two to three inches above the ground, then pack moist soil firmly around them. In "heeling in" cuttings, completely cover them from 10 to 12 inches deep in moist soil.

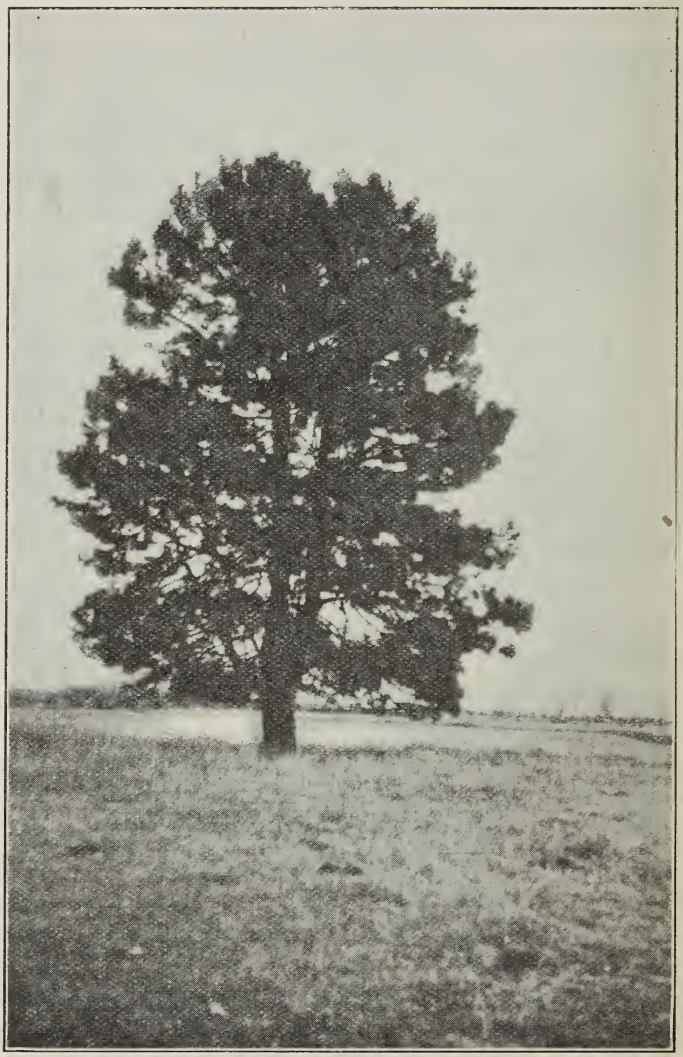
How to Plant. Plant the trees as soon after receiving them as possible, preferably on a cloudy or wet day. In doing the work two essentials must be followed in order to obtain success.

1. Always keep the roots moist till placed in the ground. Evergreen roots can not even approach dryness and the trees live.

2. Tamp the soil firmly about the trees to bring it in perfect contact with the roots.

Plant in Furrows. The quickest and best method to use in planting on the farm is to make furrows with the plow and plant the trees at proper intervals along these furrows. Do not plow too far ahead of the planting, or the ground will become dry before the trees can be put in. Carry the trees in a pail, with the roots carefully covered by wet burlap. In case it is not possible to use a plow, the trees may be put into a slit made with a spade, though this method is much slower and does not produce as good results.

Cuttings. Where poplar or willow cuttings are used, plant in the following manner: Make a slightly slanting hole with a broomstick or other instrument having a diameter a little larger than the cuttings; always plant the cuttings with the buds turned upwards; do not have more than one inch of the cutting projecting above the ground; keep the



Yellow Pine—Showing Its Development When Planted in the Open.

cuttings moist till planted; after planting pack the dirt firmly about them.

Cultivation. All plantations should be cultivated immediately after planting. This should be continued as often as is necessary to keep down weeds, during the next three to four years. Grass and weeds are among the worst enemies to young trees, and if once well started will invariably stunt their growth, and may eventually destroy the plantation.

Care. Give to the windbreak the same amount of care given an equal area planted to an annual crop, and you will find its yield, protective value, and aesthetic value one of the greatest assets on the farm.

Trees for City Streets and Parks.

Lawns and Parks. On lawns and parks where water is available and careful attention can be given to each tree, the following species are recommended, in addition to those already mentioned for windbreak purposes. It should be understood, however, that the species given below will not thrive unless considerable care is given them:

Broadleaf Trees.

Norway maple (Acer Platanoides).
Cut leaf birch (Betula alba laciniata).
Basswood (Tilia americana).
Siberian pea tree (Caragana arborescens).
White poplar (Populus alba).

Evergreens.

Austrian pine (Pinus austriaca).
Scotch pine (Pinus sylvestris).
Black Hills spruce (Picea canadensis). Var.
Blue spruce (Picea parryana).
Norway spruce (Picea excelsa).

The following species are recommended for street planting:

Street Trees.

Elm (Ulmus americana).
Green ash (Fraxinus lanceolata).
Norway maple (Acer platanoides).
Basswood (Tilia americana).
Balsam poplar (Populus balsamifera).
Cottonwood (Populus deltoides).

(The "Populus" are short-lived trees, and should not be used unless quick results are desired.)

A Common But Very Poor Method of Trimming Cottonwood Trees.

Norway Maple—This Tree Should Never be "Topped."

Trimming Shade Trees. Trimming, which is essential to the best growth and development of a tree, should never be carelessly done. The tendency of the average person, however, seems to be to prune too much or to let the tree entirely alone.

The three main objects in pruning are:

(1) To dispose of dead or diseased parts.
(2) To modify the form.
(3) To renew or stimulate growth.

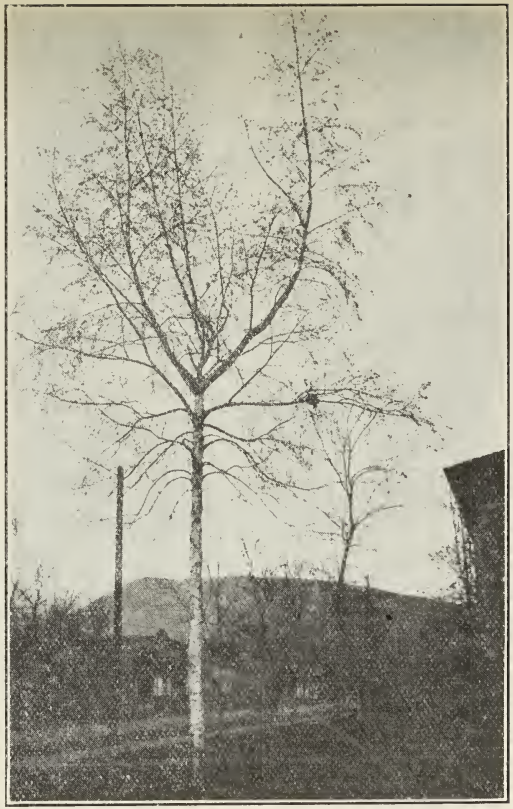
Dead or diseased parts should always be removed from a tree. If a large gap is made by this work, trim the remainder of the tree symmetrically so as to make the gap as inconspicuous as possible.

Do not shape the trees into grotesque "toadstool" or other forms not natural to tree growth. Whenever the form is modified there should be a distinct need for it such as the cutting of side branches which protrude and spoil the symmetry of the whole; the cutting of the lower branches interfering with traffic; cutting of the top where two leaders have developed. Study each tree before work is commenced, and trim it so that when completed the tree will not stand shorn of all natural beauty, but will be trimmed symmetrically and naturally.

Always use sharp instruments in this work, so as to make smooth, clean cuts. Where branches are removed, cut them as close to the trunk as possible, leaving no long protruding stubs. Rough scars are the breeding points for wood rot fungi, which, if allowed to enter the tree will ultimately rot out the heart, and if not causing death, materially retard development. In removing large heavy limbs there is always danger of the limb tearing the bark on the under side. This may be prevented by making two cuts in the branch, the first, half-way through the limb on the under side near the tree, the other, half-way through the limb on the upper side, one-half to one inch beyond the first cut. The limb will then drop clean, and the remaining stub may be cut close to the trunk. After cutting off limbs, cover the fresh wounds with common lead paint.

Pruning may be done at any season of the year, if care is exercised, but there is less danger of separating the bark from the body of the tree if the work is done in fall or winter.

Cut Leaf Birch—A Naturally and Gracefully Developed Tree.



The Cut Leaf Birch is Ruined by Trimming the Top.

THE TIMBER RESOURCES OF MONTANA.

Their Importance, Value and Use.

Estimate of Standing Timber. From the most reliable data now available, and considerable valuable work has been done along this line during the past two years, Montana's present stand of living timber of merchantable size is estimated as 55 billion board feet, log scale. This vast body of timber is made up of the following species in approximately the proportions given:

Douglas Fir	22%
Western Yellow Pine	21%
Lodgepole Pine	20%
Western Larch	11%
Englemann Spruce	8%
Cedar	3%
White Pine	2%
Miscellaneous	13%

It is estimated that 30% of this timber is privately owned, 3% is held by the State, and the remaining 67% is the property of the Federal Government. Of the latter class, 60% is located within the National Forests of the State. The other 7% is found on the Indian and Military Reservations and within the National Parks. Of the privately-owned timber, the Northern Pacific Railroad, the Anaconda Copper Mining Company, and four relatively small owners, own about 80%.*

*It will be noted that the foregoing figures are slightly changed from those given in the Third Biennial Report. A further study of the question by the Forest Service has resulted in corrected figures.

Number of Sawmills. During the year 1915, ninety-seven sawmills, producing a cut of 50,000 board feet or more each, operated in the State. The cut of these mills varied from 50,000 to 60,000,000 board feet. The following table indicates the size and general location of these mills:

Size of mill 1915 cut board feet....	East of Continental Divide.....	Flathead Region Country tributary to Flathead Lake.	Missoula Region Country tributary to Missoula River above St. Regis..	Clark's Forg Region Country tributary to Clark's Fork River.....	Kootenai Region Country tributary to Clark's Fork River.....	Total.....
50-499M	44	4	10	7	2	67
500-999M	3	6	2	4	1	16
100-4999M	....	2	2	1	....	5
5000-9999M	....	1	....	....	....	1
10,000M	....	3	4	....	1	8
Total	47	16	18	12	4	97

In addition to the mills mentioned above, there were in operation in the State during the past year about 50 mills which cut less than 50M each. Practically all of these small plants are located east of the Continental Divide. The location of the majority of Montana's mills is shown graphically on the map herewith.

Total Timber Cut. In 1915, 330,000,000 board feet of lumber was manufactured within the State. This cut includes the sawed mining timbers and sawed railroad ties. It is roughly estimated that 40,000,000 feet of mining timbers were sawed during the year and 1,400,000 ties or 70 per cent of the total tie production. There was also manufactured 10,000,000 shingles, 27,000,000 lath, 1,000,000 fence posts, 25,000 telephone and telegraph poles, and 600,000 hewed railroad ties. The mining industry of the State consumed last year 1,100,000 stulls, 550,000 pieces of lagging, and 120,000 convertor poles, all of which were produced in Montana. Fifteen thousand cords of wood were consumed in the mines in the vicinity of Butte. It is also estimated that 20,000,000 board feet of Montana's timber is consumed annually for farm and fuel purposes. In round numbers the total yearly production of lumber and other wood products

in Montana is approximately 440,000,000 feet, board measure.

Lumber Cut. The kinds and amounts of lumber produced in 1915 are given below:

	M Feet.
Douglas Fir	43,000
Western Yellow Pine	121,000
Western White Pine	27,500
Western Larch	116,300
Spruce	13,500
White Fir	6,500
Lodgepole	2,000
Cottonwood	200
Total	330,000 M Feet.

Distribution of Lumber. From the best statistics now available, the lumber cut of the State is distributed for consumption about as follows:

*Montana	40%
North Dakota, South Dakota, Minnesota	24%
Nebraska, Iowa, Kansas and Missouri	14%
Wisconsin, Michigan, Illinois and Indiana	8%
Far Eastern State and Export	9%
Southwestern States	5%

*Practically entire production east of Continental Divide is consumed locally.

Investment in the Lumber Business. Conservative estimates by the Forest Service indicate that the business of lumber manufacture in Montana represents an investment of about 22 million dollars. This does include the machinery of lumber distribution. This great industry is second only to agriculture and mining. With the proper handling of the forest resources, the lumber business of Montana will always be one of its greatest industries. Montana wants permanent industries,—not sawdust piles.

Lumber Prices in 1916. The lumber business during the present year has been in excellent condition. This is indicated by the prices for lumber which have not been higher since 1913. However, the profits in the lumber business are not so large as the general public is often prone to believe.

Profits in the Lumber Business. Most of the large Companies own considerable stumpage—some vast amounts.

The original investment in such stumpage was not large, at least on the M foot basis. Carrying charges on standing timber, such as taxes, fire protection, administration, etc., are also comparatively low per M board feet. But when a considerable amount of timber is held by one company the money which must be raised annually to meet these charges is often a very large item. To meet these annual charges a certain amount of timber must be cut, manufactured and converted into cash. This naturally leads to over-production and reduced prices due to competition, and the annual carrying charge, when apportioned per M over the lumber actually manufactured, amounts to a considerable figure. Actual profits are thus greatly reduced The manufacturer who does not own timber, although not handicapped to the same extent, must, however, meet the competition mentioned above, with the result that his profits are materially reduced.

The Taxation Problem. Standing timber is now taxed in accordance with the general property tax. This repeated taxation of a crop which will yield a return but once is in general favor with the majority of the voters due to the fact that they consider that the owners secured these holdings for little or nothing and that by such a tax, a portion at least of the unearned increment will be returned to the public. A yield tax whereby the tax could be paid at the time the timber is cut has been suggested as a means of doing away, to a large extent, with the evils of over-production, cut-throat competition, low prices and poor utilization, all of which are detrimental to the lumber industry. Unquestionably a tax on such a plan would at least materially help the situation.

Forestry Fair Building. The importance of the lumber industry of Montana and the great forest area of the state emphasizes the need of a Forestry Exhibit Building where can be assembled in permanent form an attractive educational display, showing, not only the products of the forests and mills of the state, but also the methods followed in protecting this vast natural resource and increasing its value. Such a building should, of course, be located at the State Fair Grounds, and the exhibit so arranged that, if so desired, portions of it can be transferred to county and district fairs and to international expositions.

Those who have given thought to this matter believe that an artistic building, in every way suitable for this purpose can be erected for $15,000. Mr. F. A. Silcox, the District Forester, has undertaken to raise half of this sum by soliciting contributions from the lumbermen throughout the State on an assessment basis of 1½c per M board feet on their annual cut. This movement is meeting with success, and if the state will interest itself to the extent of appropriating the remaining $7,500 a deserved recognition will be given the lumber industry of Montana and a valuable and permanent improvement will be added to the State Fair. It is respectfully recommended that this matter be given earnest consideration.

QUALITIES AND USES OF THE MORE IMPORTANT MONTANA WOODS.

Western Pine (pinus ponderosa) is the chief lumber producing tree of Montana. The wood is light and resinous, the grain fine but often twisted, and the growth variable. It is not especially durable when in contact with the soil, lasting on the average about five or six years. Forest Service strength tests made of small clear specimens cut from trees collected in Montana gave a modulus of rupture of 4950 pounds per square inch and a crushing strength of 2370 pounds per square inch.

The tree produces an average of about 13 per cent select grades, 12 per cent shop lumber and 75 per cent common grades. The wood is very extensively used in the mines at Butte and has a large variety of other uses, ranging from the coarsest construction to the high finished product. A large part of the total amount produced in Montana is consumed within the State, but quite an amount is also shipped out.

Western Larch (larix occidentalis) produces very nearly as much lumber in Montana as does Western pine. The wood is heavy, of fine growth, but is not very durable when placed in conditions subjecting it to decay. Forest Service strength tests of small clear specimens cut from trees collected in Washington gave a modulus of rupture of 7250 pounds per square inch, and a crushing strength of 3700 pounds per square inch. The tree does not produce much select lumber, 92 per cent going into the common grades and eight per cent into the select. The wood is used to quite an extent by the Butte mines and also for general building and construction purposes, for ties and for paving blocks. A considerable quantity is shipped out of the state to the prairie states of the middle west.

Douglas Fir (pseudotsuga taxifolia) is one of the smaller lumber producing trees of Montana. The wood is considerably lighter than larch but heavier than the Western pine in the dry condition. The fir grown in Montana is rather knotty and course grained, but is slightly more durable in contact with the soil than either larch or pine. Forest Service strength tests of small clear specimens cut from trees collected in Wyoming gave a modulus of rupture of

6340 pounds per square inch, and a crushing strength of 2920 pounds per square inch. The tree cuts out a very small percentage of selects, 98 per cent going to common lumber and only 2 per cent in the select grades. In Montana, fir and larch are graded and sold together owing to the very small percentage of selects in each of these species. The wood is used in the Butte mines and for general rough construction purposes and ties. Most of the output is consumed within the State.

Lodgepole Pine (pinus contorta) is one of the minor lumber producing species of Montana. The wood is rather light, of slow growth, and not durable when placed in conditions subjecting it to decay. The Forest Service strength tests of small clear specimens cut from trees collected in Wyoming gave a modulus of rupture of 5170 pounds per square inch, and a crushing strength of 2400 pounds per square inch. Only a small percentage is manufactured into lumber and if so manufactured yields mostly common lumber, only 7 per cent going into the Selects, while 93 per cent goes into common grades.

This wood is the chief source of stulls, lagging and converter poles for the Butte mines where enormous quantities are consumed annually. It is also used for ties and fuel and to a slight extent for fence posts and telephone poles. Practically the whole output is consumed within the State.

THE PRESERVATION OF WOOD.

General.

Wood preservation is now a well established industry. In 1915 there were 102 wood preserving plants in the U. S. which treated 141,858.963 cubic feet of wood.

Montana has three plants, namely, the G. N. Railway Company's tie treating plant at Somers, the N. P. Railway Company's tie treating plant at Paradise, and the Anaconda Copper Mining Company's mine timber treating plant at Rocker.

Preservatives Used.

Several different wood preservatives are used, but creosote and zinc chloride are by far the most common and represent the largest proportion of the total. In 1915 the industry consumed 80,859,442 gallons of cresote. 33,269,604 pounds of zinc chloride and 4,899,107 gallons of other preservatives, including crude oil, coke-oven tar, refined coal tar and carbolineum oils. Of the total amount of creosote used in 1915, 34,464.028 gallons, or over 42 per cent was imported from England and Germany. The amount of imported creosote used, however, is decreasing each year, due to the increased production of domestic creosote and the increased use of mixtures of coal tar creosote and tar. In 1914 the price of domestic creosote was approximately 8½ cents per gallon f.o.b. plant and the price of zinc cdloride, 3 cents per pound.

Processes.

The various processes used in wood preservation may be broadly divided into two classes: non-pressure and pressure processes.

Non-pressure processes are those which depend either upon the absorption qualities of the wood or the atmosphere to force the preservatives into the wood. Since only atmospheric pressure is used light apparatus only is required. In this class are brush treatments, dipping, steeping and the so-called open tank treatments used principally for telephone poles and fence posts.

The pressure processes are those which depend upon artificial pressure to force the preservative into the wood. On account of the heavy pressure, strong expensive apparatus

is required for this class of treatment. Included in this class are most of the patented commercial processes, among which are the Wellhouse Process, the Card Process, the Allardyce Process, the Rueping Process, the Lowry Process, the Rutgers Process, the A. C. M. Process, the Buehler Process, the Bethell (Full cell Creosote) Process, and the Boiling Process.

It would be beyond the scope of this report to completely describe each of the non-pressure and pressure processes. However, a brief discussion of the more important processes of each class follows:

Non-Pressure Processes.

Brush Treatments. These treatments consist in applying the preservative, generally hot, to the surface of the wood with a brush. The wood should be thoroughly seasoned to facilitate the absorption and to prevent subsequent checking through the treated wood. All checks and openings should be filled with the preservative.

Dipping. This treatment consists of dipping the wood in a preservative contained in a tank. It is generally more satisfactory than brush treating because all checks and openings are more liable to become filled with the preservative than in brush treatments. Only peeled, well-seasoned wood should be treated in this manner.

Steeping. Under this form of treatment comes the patented Kyanizing Process. The wood is steeped in a solution of bi-chloride of mercury under atmospheric pressure and temperature. On account of the corrosive action of the solution, on metal it is impossible to use metal tanks unless they have a specially prepared surface.

Open Tank Process. This treatment is made by heating the wood in a bath of hot preservatives in an open tank for a certain period and then quickly transferring it to a cold bath of the same preservative. The hot bath drives off some of the sap, air and moisture contained in the wood cells. The cold air causes a sudden contraction of the sap, air and moisture remaining in the cells and forms a vacuum which must be overcome by an inrush of preservative.

Pressure Processes.

The Burnett Process. The timber to be treated is placed in a closed retort and a solution of chloride of zinc is run in.

A pressure of 100 to 150 pounds is then applied until as much solution as is desired has been forced into the wood. The solution is then drained from the retort and the timber removed.

The Rueping Process. The timber is placed in a closed retort and the retort and wood are filled with compressed air. Creosote is then run into the cylinder at a little greater pressure and the air allowed to escape as the oil runs in. When the cylinder is full a pressure of 150 pounds or more is put upon the oil and maintained until the wood will absorb no more. The cylinder is then emptied and a final vacuum drawn which increases the expansive force of the compressed air in the timber and forces out considerable oil.

This process gives deep penetration with slight absorptions. It is frequently called an "empty cell" process..

The Bethell Process. This process is similar to the Burnett Process, only creosote is used as a preservative instead of zinc chloride.

The Card Process. The timber is placed in a closed retort and a solution of creosote and zinc chloride is run in —80 per cent of zinc solution to 20 per cent of creosote. The solution is kept mixed by a centrifugal pump in the top of the cylinder which draws the preservative off from the top and returns it through perforated pipes in the bottom. The process itself is practically similar to the Bethell process, with the exception of the preservative used.

The Preservative Treatment of Fence Posts and Telephone Poles.

Fence posts and telephone poles are generally treated by the open tank method before described. As a rule, only the less durable woods are treated, such as the pines, fir, cottonwood, spruce, etc. Lodgepole pine which grows in Montana in large quantities is a timber particularly well suited for fence posts and the smaller class of telephone poles and takes treatment unusually well.

In 1911, 52 lodgepoles pine poles 7"-25' were treated by the Anaconda Copper Mining Company. at their treating plant at Rocker as an experiment and the poles were then placed in service. The cost of the treatment was 43 cents per pole. Figuring the life of untreated cedar poles at 10 years and treated lodgepole pine at 22 years (which is the

length of life estimated by the Forest Service), the annual saving from using treated lodgepole pine poles is 50 cents per pole.

In 1909 the Forest Service creosoted the 10,000 cedar posts used in the construction of the National Bison Range fence at Dixon, Montana. These posts were recently inspected after seven years' service and were found to be in as good condition as when originally placed. 380 untreated Western pine posts set in the same line at the same time as the cedar, were so badly decayed in 1912, after three years' service that they were all removed and replaced with treated cedar.

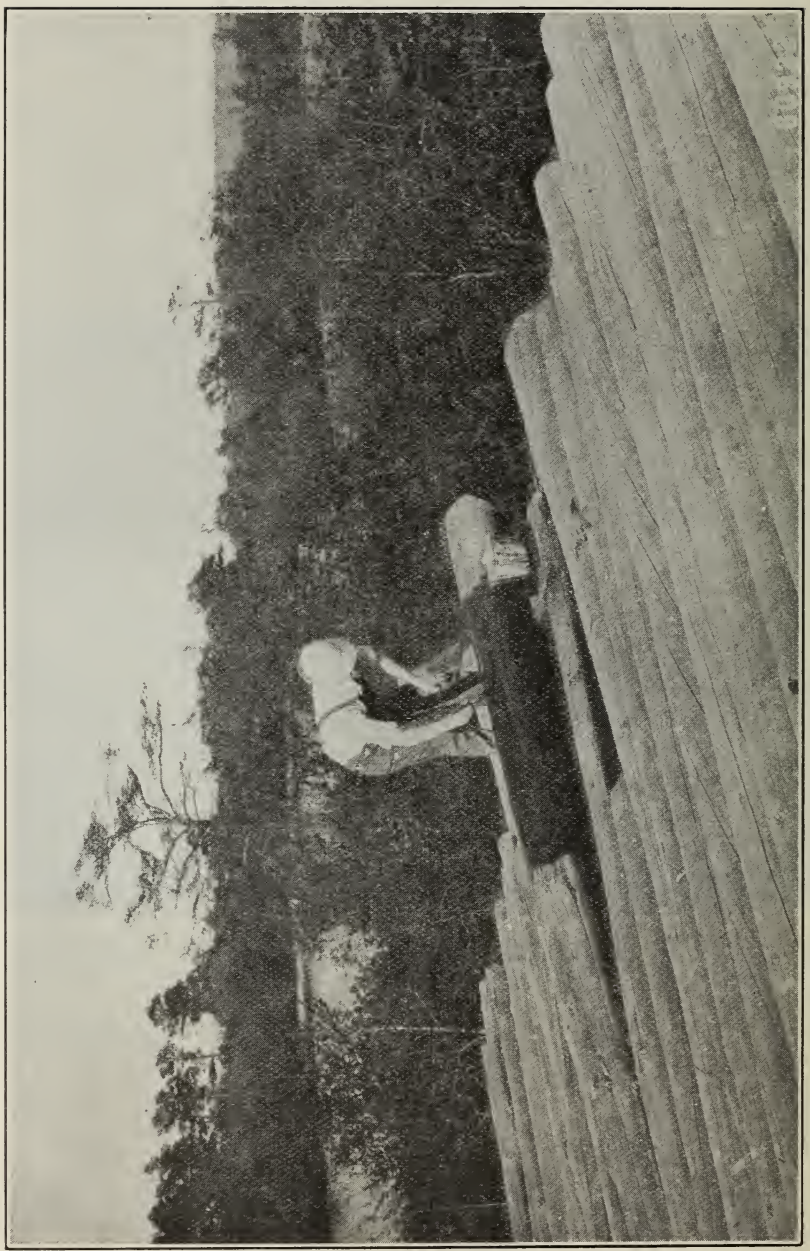
Lodgepole pine in the round form should make an excellent post when treated. It is well shaped, very strong, and is easily treated. It can be obtained at a cost of a few cents per post, given an open tank treatment with creosote at a cost around 15 cents per post and should last from double to treble as long as the untreated posts of other species now commonly used at very little increase in cost.

Additional Life Secured by Preservative Treatment.

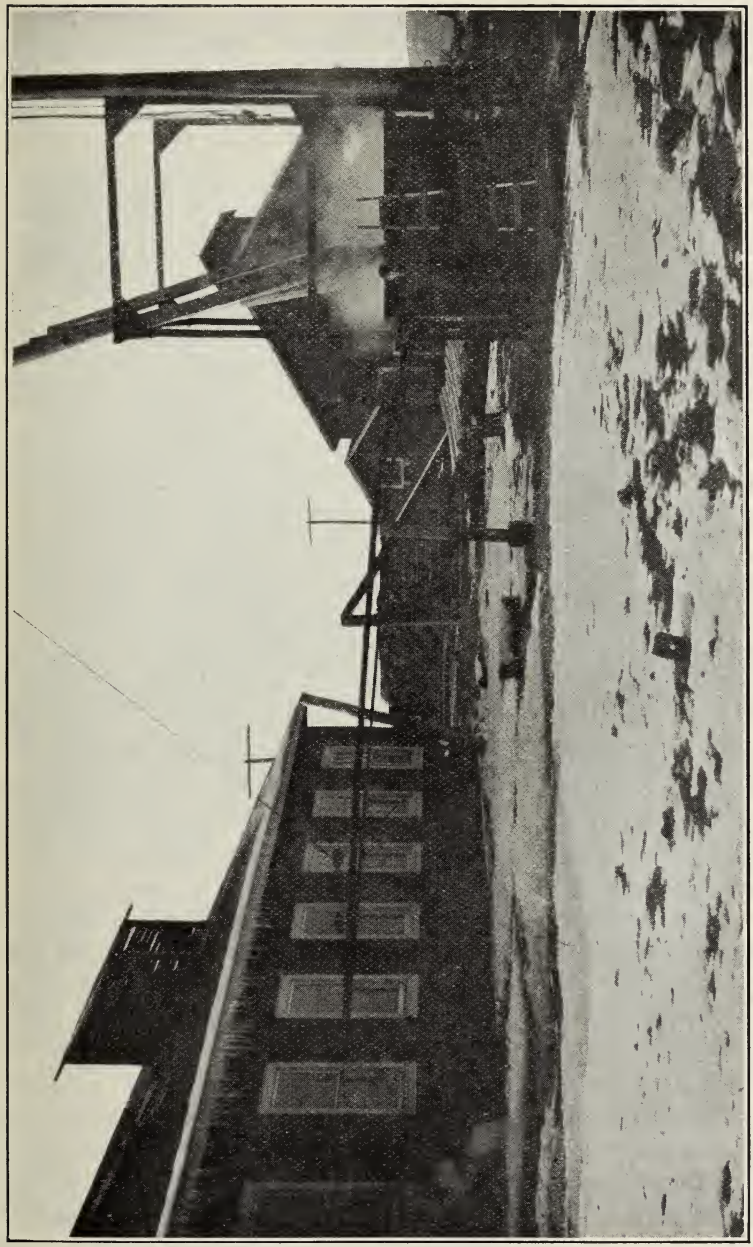
The additional life secured by preservative treatment has been found to well warrant the cost of treatment.

It has been estimated that the life of lumber from some of the less durable woods, such as basswood, cottonwood, spruce, hemlock and pine, placed in conditions favorable to decay can be more than trebled when given a suitable preventative treatment. Estimates place the life of treated larch, fir and pine posts at 20 years, while untreated they generally have a life of from only five to eight years. Untreated fir, larch and pine ties lasts on the average from five to seven years, while estimates place the treated life of these species at 15 years. The life of fir, pine and cedar posts is increased from an average of three to ten years untreated to around 20 years treated.

Method of treating fence posts by the open tank treatment. The posts in the tank in the background are being heated in the hot oil and will later be transferred to the tank of cold oil in the foreground.



Treating the Butts of Telephone Poles by the Brush Method.



Treating Lodgepole Pine Telephone Poles at the Treating Plant of the A. C. M. Company, at Rocker, Montana.

FIRE PROTECTION IN MONTANA.

In the third biennial report (1914) of this office, I outlined what I considered to be the duty. as well as the proper function of the State in the scheme of fire protection in Montana. I want to again emphasize that position. Briefly it is as follows:

Cooperation With the Federal Government. Montana's mountain forests are largely controlled by the Forest Service. The State, for the most part, has only scattered holdings of very minor importance compared with the whole area. The Forest Service maintains an efficient fire detection and fire-fighting organization. Practically every private owner of stumpage has recognized the value of one central organization and is paying his pro-rata share of fire protection on an acreage basis, the money being disbursed through the Forest Service. The State has recognized the logic of this position and with the exceptions noted below is doing likewise.

Fire Protection on Outside Areas: It has been estimated that there is about 4,000,000 acres of timbered land beyond the reach of the Forest Service Protective Organization. The State must assume the burden of protection for such lands either through the organization of associations or directly. I regret that the State has been unable to provide this protection. It means the appointment of paid fire wardens during the fire season and the employment of fire patrolmen together with the organization of a thorough system of inspection. It is the State resources at stake, even much more than the resources of private owners.

The Northern Montana Forestry Association. The Northern Montana Forestry Association continues to do good work and this office cooperates with it to the fullest extent of its authority. The association cooperates with the Forest Service and is affiliated with the Western Forestry and Conservation Association.

Fire Prevention State's Function. As stated in the third biennial report perhaps the biggest job of the State and its most important function in fire protection is the field of prevention—which is largely publicity work—educating the people to be careful through realization of the danger. Being in close touch with the people, the State has a sympathetic audience with which to deal. Too much stress cannot be put

on the importance of this part of fire protection. The resources for carrying on such a campaign are unlimited. Numerous signs and posters, booklets and other literature have been distributed to schools and other public places of meeting. To a limited extent lectures have been carried on, but with no organized effort. At present there are in existence a number of moving picture films which are being exhibited throughout the country on various phases of Forestry work and fire protection. This form of advertising graphically illustrates the necessity of care with fire in the woods, and at the same time adds to the entertainment and amusement of the people.

Publicity Campaign. A live and resourceful publicity campaign which will reach every corner of our State should be organized so that every citizen and every school child will learn more about our Forestry problems, and realize the importance of Fire protection. It would not require a large appropriation to carry on such a campaign, and certainly the money spent would be doubly repaid by the effort. The records since 1908 show that campers have set over 10 per cent of the fires in Montana; 27 per cent have been set by lightning, all others are of human origin. In view of these facts it does not seem at all unreasonable to emphasize the need for a publicity organization.

1916 Fire Season. The 1916 fire season has been decidedly subnormal. The records of the State show no fires of any consequense, while the Federal Government report only 154 fires, costing $1,340.00 outside of the patrol, to suppress. Of these fires, 166 were under ¼ of an acre, 67 under 10 acres, 17 under 100 acres, and only four over 100 acres in area. Over 20 per cent of these fires were caused by campers, 4 per cent incendiary and the rest by railroad and lightening. In a season where rains are frequent, which was typical of 1916, camp fires are not usually so dangerous, lightening being the most severe menace. Since it requires from 100 to 150 years to grow a crop of timber in this State, of sufficient size to be of commercial value, we must realize that during that time a great many dry seasons such as 1910 and 1914 will occur. The fire protective organization must always be primed to meet such conditions.

Specialized Equipment. From year to year the science of fire protection is rapidly developing. This has been parti-

cularly true in the matter of specialized equipment. The old type of pot and pan cooking outfits and hay wire pack equipment is fast disappearing, and being replaced by compact, light rust-proof Nested kitchen and mess equipment emergency kits, and standard pack outfits which are the best made.

Railroad Fire. Reports received on the railroad situation indicate that little or no improvement has taken place toward placing the rights of way in a safe condition. The railroads are prone to feel that such expeditures are not necessary so long as they are unmolested. The season affects this condition more than any other factor. It requires more than an average dry season for trains to set fire along rights of way. The railroads should be required to remove all inflammable material, for at least 50 feet on each side of the right of way, construct a fire guard at least two feet wide cut to mineral soil on the exterior edge of the clearing, and burn the grass of the ground, annually. This is not necessary, of course, after the railroad has been electrified. It does not seem reasonable to assume that because railroads are necessary for the benefit of the present day public, that this source of danger should continue.

The records of the Federal Government in the States of Idaho and Montana, show that 41.1 per cent of the total of the 8,703 fires which have occurred since, and including 1908, were caused directly by railroad operations, and that many of these were dangerous fires, destroying millions of feet of timber in both 1910 and 1914.

Under Weeks Law Cooperation. Under the Weeks Law Agreement the Federal Government contributes to the State each calendar year through the Forest Service $3,500.00 for fire protection, and $100.00 for publicity, or fire prevention purposes. The $3,500.00 is consumed in defraying one-half of the salaries and expenses of patrolmen, and Forest Guards employed by the Forest Service, covering cooperative State and Forest Service territory. The State pays the other one-half of the salaries and expenses of these men, but their supervision is entirely in the hands of the Forest Service, since the State has no active fire protective organization with which to supervise the expenditure of these funds. If the State would organize a protective force and appropriate suffi-

cient funds to carry on the work. this Weeks Law money could be divertly directly under State supervision. Unless such a step is soon undertaken, it is very probable that the Weeks Law fund will be withdrawn since the primary object of the Government in donating the money is to stimulate organized fire protection of Forests on water sheds of all navigable streams not covered by Federal protection. The full extent of the government is not being carried out in the absence of the State organization. I believe that the State should appreciate this fact, and along the lines proposed before, take some definite steps toward organizing a sufficient force to protect the scattered State holdings and cooperate more fully with the Federal Government.

Northern Montana Forestry Association.

"Kalispell, Montana, September 8, 1916.

"To the Board of Directors,

"Northern Montana Forestry Association.

"Owing to recent rains extending over all Western Montana, which has thoroughly soaked the forests, thus eliminating all danger from forest fires this season, and acting upon advice of the majority of the Board of Directors, you are hereby notified that the patrol service for the season was discontinued on September 7th, 1916.

"The fire season just closed was one of the most successful in the history of the organization, covering a period of five years.

"No fires of any consequence were reported, and outside of patrol services and administration expenses, there was no cost in handling the fire situation this season.

"Thanking the Directors for their cooperation in the work, we remain,

"Yours very truly,

"NORTHERN MONTANA FORESTRY ASSOCIATION,

"By A. E. Boorman, Secretary."

RECOMMENDATIONS.

Recommendations for improvement in existing laws are as follows:

1. There should be a closed fire season between June first and October first, during which time, in the interest of public safety, it should be unlawful for any camper, logger or other individual, firm or corporation to set or cause to be set out, fires in slashings, brush heaps, down or fallen timber, on forest or prairie lands including state, federal or private holdings, for the purpose of cleaning land of inflammable material, without a written or printed permit from a fire warden or deputy fire warden, and compliance with the terms thereof, which shall prescribe the conditions upon which the permit is given and which are necessary to be observed in setting such fire and to prevent from spreading and endangering the life or property of another. At no time shall any fire be set out when the wind is blowing to such an extent as to cause danger of the fire getting beyond the control of the person setting it out or without sufficient help present to control it and the fire shall be watched by the person setting it until it is out.

2. Provision should be made whereby the Forester is authorized to appoint five wardens in various parts of the state who will have power to incur expense in connection with fire prevention and fire-fighting, and who shall be paid a salary by the state during the fire season and a certain sum should be set aside for the payment of these wardens and their necessary expenses and also for a fund for fire fighting.

3. All railways in the state should be required to clear their right-of-ways of all inflammable material and to keep them in such condition during the period from June 1st to October 1st. Further, a continuous fire line should be constructed on each side of the railway track at the extreme outer edge of the right of way which should be cleaned off down to mineral soil and kept in this condition during the fire season from June 1st to October 1st.

4. From June 1st to October 1st it should be unlawful for any person, firm or corporation to use any locomotive, logging engine, portable engine, traction engine or stationary engine using fuel other than oil located in or passing through a timbered district, which is not provided with a good and

sufficient spark arrester, and sufficiently guarded against the escape of fire from the ash pan or fire box.

5. It should be necessary for any person, firm or corporation engaged in the cutting or removing of timber, logs, ties, telegraph poles, wood or other forest products, from lands within the State of Montana, whether public or private, to burn or otherwise dispose of the brush, slashings, and all inflammable material incident to such cutting, at such times and under such methods and restrictions as shall be prescribed by the chief fire warden or his assistant, or any district fire warden and not otherwise.

RECREATION IN THE MOUNTAIN FORESTS OF MONTANA.

The two great National playgrounds of Montana—Glacier and Yellowstone Parks—are so well known throughout the land that time or space will not be taken for a description of them or the mode or travel in seeing their wonders. The object of this little chapter is to briefly describe a very few of the other beauty spots of our great State that are close rivals to these far-famed scenic wonders. Many of our most beautiful and picturesque places of interest are off the beaten track of the tourist and pleasure seeker and thus due to their modest retirement, have not attained the popularity and notoriety of their more favored rivals.

Flathead Lake. Flathead Lake, the largest body of fresh water in the United States, with the exception of the Great Lakes, offers unparalleled opportunities for the location of villa sites and camping places along its extensive shores. The lofty peaks of the Mission range, crowned with perpetual snow, with numerous uncharted glaciers lying in their laps, offer the adventurous traveler an opportunity to try his skill as a woodsman and mountaineer. This is one of the most rugged mountain chains in Montana and the glistening glaciers nestling under towering peaks and cliffs are unexcelled for beauty. Flathead Lake is easily reached from Kalispell on the Great Northern Railway or from Ravalli on the Northern Pacific. A good automobile road extends from Missoula to the shores of the lake as well as from Kalispell.

Clearwater River Valley. The Clearwater River Valley, three of four hours auto ride from Missoula, offers at the very door of civilization a forest primeval where the visitor may find rest and quiet on the shores of the placid lakes or in the shade of the murmuring pines. The route to the valley from Missoula is through the Blackfeet Canyon where every turn of the highway brings an ever-changing scene to the eye of the traveler. The Blackfoot Valley, of which the Clearwater is a tributary, offers many attractions. Around the hamlet of Lincoln is located one of the most magnificent forests of western yellow pine.

Beartooth Mountains. The Beartooth Mountains in the Beartooth National Forest, fifty miles by good auto road from Billings, is acknowledged by the few who have ventured into their depths to be the most rugged and picturesque in

Evening Scene Where the Speckled Trout Play.

Home of the Grizzly Bear.

the Northwest. This region is a vast wilderness of high mountain peaks, of deep mountain gorges whose walls in many places rise perpendicularly for two or three thousand feet, of innumerable lakes lying at the feet of perpetual snow fields or hidden in the dark depths of spruce and alpine forests; of high, open glaciated plateaus far above the timber line, of roaring cataracts and torrents as well as glaciers, caves, and many other wonders of Nature. Vast areas of this region remain unexplored and unmapped. Here is the Switzerland of America, awaiting the arrival of the sturdy visitor whose adventurous spirit clamors for the vast unknown; awaiting him to assail the crest of her lofty peaks or explore the dark mysteries of trackless forests. This region may be reached from the Northern Pacific Railway at Billings or Columbus, from which points good roads extend to the mountains. These are only a very few of the more accessible and picturesque spots of Montana that are unrivaled in beauty by any in the world.

A trip up Bitterroot Valley over the Park-to-Park highway, through the Big Hole Basin, reveals many wonders that are impossible to discribe.

The Kootenai River and the Yaak River Valleys are not to be missed. The Kootenai River is one of the most beautiful rivers in the Northwest.

Anyone desiring to find a "beauty spot" in our great State needs, in the majority of cases, only to raise his eyes from the ground and he will see, in this respect, that Nature "strives to please" in Montana.

The Forest—a Place of Fish, Streams and Game.

In addition to the beauty of Montana forests, the countless turbulent and flashing streams and the numerous shimmering lakes afford the traveler of piscatorial tendencies with royal sport outwitting the wily trout and the pugnacious grayling. A few of the most accessible and noted streams of the State are the South Fork of the Flathead River, Madison River and tributaries, the Stillwater, Big Boulder of Sweet Grass County, the Gallatin and tributaries, Red Rock River and lakes, the Kootenai, Yaak, Landers' Fork of the Blackfoot, Clearwater River and Lakes, Swan River and countless other smaller streams and lakes that abound with trout.

When for any reason the supply in the streams is

depleted the State authorities and other agencies are zealous in restocking the waters with the choicest varieties of game fish. Unfortunately, however, such efforts are often unavailing in consequence of the depositing in creeks and rivers of tailings and other deletrious waste products of mine and mill. It is to be sincerely hoped that in the near future means may be devised whereby fish left in those streams may be maintained without serious interference with one of the Treasure State's greatest industries.

Last, but not by any means least, is the game that make Montana's unrivaled forests its home. Here the ruffled grouse beats his muffled drum to the shrill bugle of the elk. Numerous deer, sheep and goats are denizens of these woods and the protection of these animals during the closed season, as well as the protection of this natural habitat from the ravages of fire, by State and Federal officers, has increased their numbers wonderfully in the past few years. If one wishes a more adventurous sport with the added spice of danger, a trip in May or June to the heads of the Blackfoot, South Fork of the Flathead, Swan or Sun rivers will place him at the very door of the grizzly's home. This period is immediately after the animal's winter hibernation and being ravenously hungry he covers a vast territory in the course of a day in the quest of food. At this time he is ferocious and is not apt to be shy of the hunter. This is especially true of the grizzly or "Silver Tip." If the hunter is fortunate enough to bag his game, he secures an excellent prime pelt for his pains. Bear (one of our noblest game animals) should by all means be protected.

Cost of Various trips and Equipment Needed.

It can be truthfully said that a vacation in any of Montana's Forests can be arranged to suit any individual taste or any purse. One may wander through the woods for the mere cost of coffee, flour and sugar. If game is in season, he can, by supplementing his gun with his rod, spread a table that will not be surpassed by that of the most exclusive metropolitan hotel. A trip of this nature may be taken at a small outlay of 50 to 75 cents per day which will cover all necessities. Expensive equipment for a tramp through the woods is unnecessary. Good woolen clothing, calked or hobnailed boots and a very few personal effects should constitute the personal equipment, and a Duluth pack sack, to-

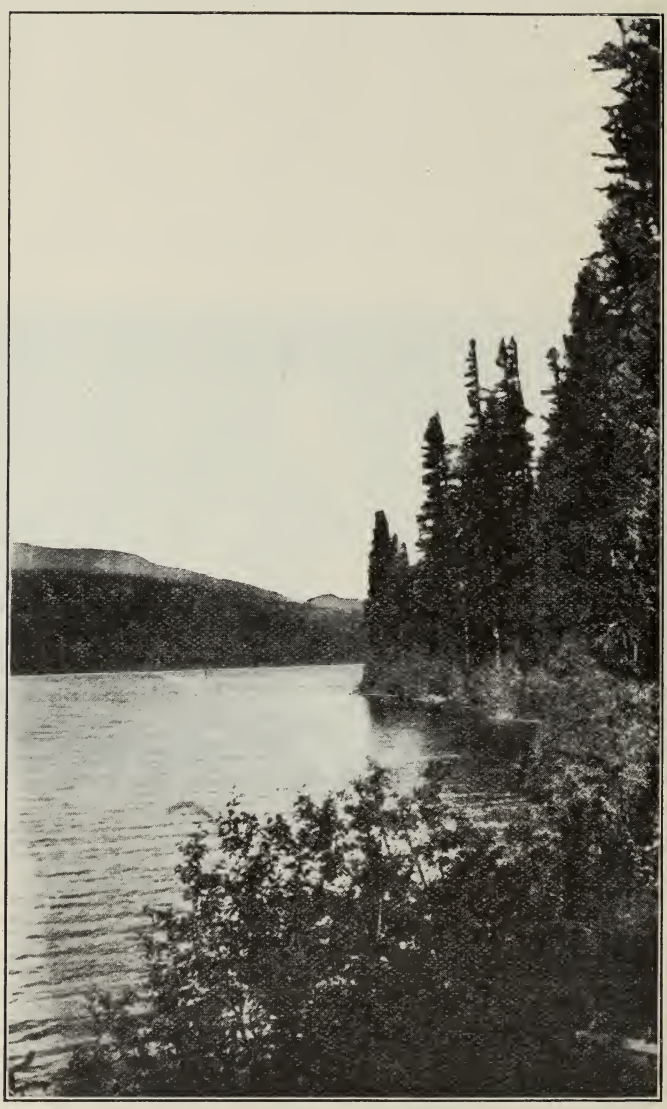
gether with a light sleeping bag, a small silk or silkolene tent, an ax with a razor edge, and a simple assortment of mess and cooking equipment should constitute an outfit. Accessories such as fishing tackle, guns, ammunition, etc., are essential if one desires to make nature father his larder. Last but not least is the camera. Many a winter evening may be whiled away and the joys of the vacation lived again with the aid of a few pictures secured while on the trip. The type of outing, however, requires courage and endurance coupled with a love of Nature in her primal state. The faint-hearted or indolent visitor had better stay close to the beaten paths of civilization for he has no place in Nature's wild scheme and she has little love for him. Those who may afford the expense can secure saddle and pack animals at a reasonable cost of from $1 to $2 per day. The necessary guides, cooks and packers may be secured at a wage of from $2.50 to $5.00 per day. In addition to this, the necessary expense for food supplies and personal equipment must be added. The expense attached to this sort of a trip varies from $2.50 to $10.00 per day per individual, depending on the number of persons sharing the expense of the expedition.

If this does not appeal to the visitor, he may motor to the steps of a first-class mountain inn where accommodations equaling those of many of the best hotels may be secured at rates varying from $2.00 to $5.00 per day. These inns are situated for the most part in regions that abound in fish and game.

One of the most popular camping methods for those who own autos is to load their tents and other camp equipment into the machine or on to a trailer and wander along one of Montana's good roads until a desirable spot is found. In this respect the National Forests offer unexcelled opportunities and a post card or letter written to the nearest Forest Service officer will bring you valuable information. The Forest Rangers are always ready to impart information to help the visitor in the Forest.

The advertising of Montana's recreational features is of the utmost importance in the economic development of the State. It has more wonderful scenery and a better supply of game and fish than perhaps any region in the world. The proper advertising of our recreational resources will mean an influx of visitors from all parts of the country—some of

A Summer Camp in the Forest.



Camp Sites May be Leased from the Forest Service on the Shores of Hundreds of Beautiful Lakes.

whom will be business men, men who are looking for new business ventures. The vast resources of the forests, mines and agriculture practically as yet untouched, offer to the capitalist an unsurpassed opportunity for investment. Visitors who are pleased with the recreational advantages of the State are bound to notice the possibilities, through development, of such an empire. Many of these may build summer homes in our Forests so that they may have more or less of an investment in the development of the State.

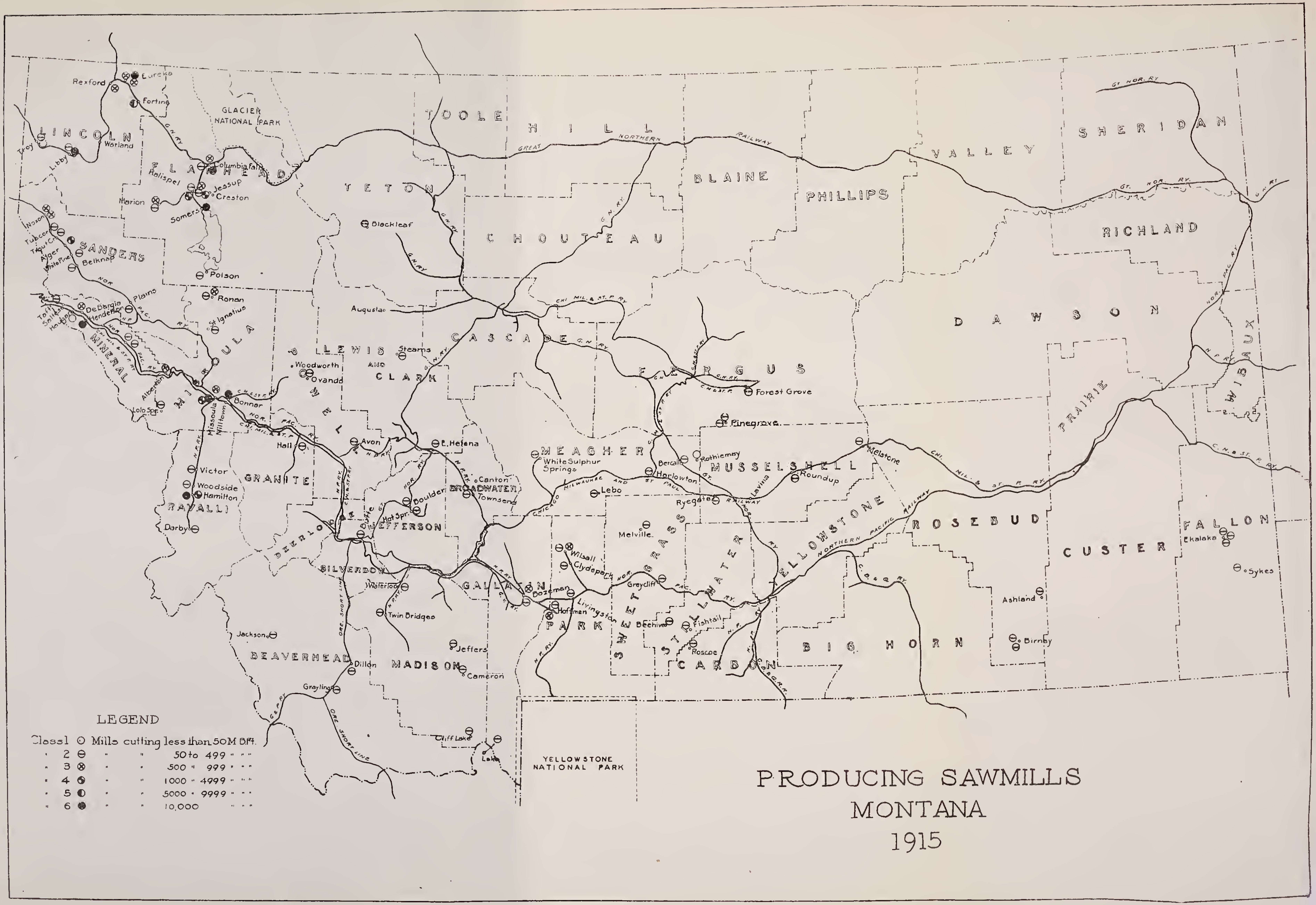
Sites for Summer Homes.

The National Forests are open to the summer home-seeker. Around many of the most beautiful lakes in the State, building sites may be leased from theFederal Government for periods of one year to fifteen years, with the pre-preference right of renewal for the nominal sum of $10 to $15 per year. There are no taxes, no filing fees. The few restrictions are reasonable and there is no "red tape." There are many locations along the shores of our numerous lakes located within the boundaries of the National Forests where the city dweller may possess his own summer home or week-end cabin. Here he may tramp or hunt over the ranges, fish in the streams, climb the peaks, build his fire on his own hearth-stone and fall asleep to the song of the wind in the trees and the gentle "swish" of the lake waters caressing the shore. Full information regarding camp or building sites in the National Forests may be secured from the District Forester at Missoula.

Information regarding the State may be secured from "The Resources and Opportunities of Montana, 1916 Edition," a copy of which may be secured by applying to the Commissioner of the Department of Agriculture and Publicity, Capitol Building, Helena, Montana.

In the compilation, and illustration in this report, I received valuable assistance from the District Forester, of the National Forest Service, Missoula.

On all occasions this office has received the closest co-operation from the Forest Service; the Dean of Forestry of the University of Montana, and the Northern Montana Forestry Association, whose courtesies have been more than appreciated by the State Forestry Department.



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